DOI: 10.46991/JISEES.2025.SI1.130

Assessment of Spatial and Temporal Changes of Lake Sevan Shorelines for the Period 1929-2022, Using Remote Sensing and GIS

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ABSTRACT

Lake Sevan, one of the largest high-altitude freshwater lakes in the world, is characterized not only by its great importance for Armenia and the entire region, but also by an interesting history of anthropogenic impact – the manmade lowering of the water level in the lake by more than 18 meters, which affected almost all the aspects of the lake and its coastal areas. This research considers the spatiotemporal changes of the shoreline of Lake Sevan as a result of water level changes during the period 1929 (natural state) to 2022, using remote sensing and GIS data. Based on bathymetric map of lake Sevan (1929) and Landsat satellite data (1973, 1985, 1990, 1995, 2002, 2015, 2022), using the NDWI spectral index, shorelines were derived for certain periods - most coinciding with changes in the lake's water balance. Using Digital Shoreline Analysis System, changes in the lake shoreline were analyzed and quantified for each specified period and for the most modified sections of the coastline. As a result of the water level lowering in Lake Sevan, almost 1440 km^2 of land was freed from water. The largest "movement" of shoreline during the study period occurred between 1929 and 1973. And the main changes in the nearshore areas are observed in the northwestern, western, southern and far southwestern parts of the lake, as well as Artanish peninsula. This phenomenon is explained by morphological peculiarities of the coastal zone and the lake bed. As a result of the rise in the lake's water level that started in 2002, a total of more than 2,370 hectares of coastal territory were flooded, of which at least 1,900 hectares were covered with woody and shrubby areas.

Keywords: Lake Sevan, remote sensing and GIS, shorelines, spatiotemporal changes

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